


EUCHNER

Operating instructions

Transponder-Coded Safety Switch With Guard Locking
CTP-AR Unicode/Multicode

EN

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1. About this document







1.1. Scope

These operating instructions are valid for all CTP-L-AR... from version V1.0.0. These operating instructions together with document "Safety Information and Maintenance" as well as any data sheet enclosed form the complete user information for your device.

1.2. Target group





Design engineers and installation planners for safety devices on machines, as well as setup and servicing staff possessing special expertise in handling safety components.

1.3. Key to symbols

Symbol/depiction	Significance
	Printed document
	Document is available for download at www.EUCHNER.de
	Document on CD
	This section is applicable only if the memory card is used
 DANGER WARNING CAUTION	Safety precautions Danger of death or severe injuries Warning about possible injuries Caution minor injuries possible
 NOTICE Important!	Notice about possible device damage Important information
Tip	Tip/useful information

1.4. Supplementary documents

The overall documentation for this device consists of the following documents:

Document title (document number)	Contents	
Safety Information and Maintenance CTP (105517)	Basic information on safe setup and service	
Operating instructions (123041)	(this document)	
Possibly enclosed data sheet	Item-specific information about deviations or additions	
	Important! Always read all documents to gain a complete overview of safe installation, setup and use of the device. The documents can be downloaded from www.euchner.de . For this purpose enter the doc. no. in the search box.	

2. Correct use

Safety switches series CTP-L-... are interlocking devices with guard locking (type 4). Devices with unicode evaluation possess a high coding level; devices with multicode evaluation feature a low coding level.

In combination with a movable safety guard and the machine control, this safety component prevents the safety guard from being opened while a dangerous machine function is being performed.

This means:

- Starting commands that cause a dangerous machine function must become active only when the safety guard is closed and locked.
- The guard locking device must not be unlocked until the dangerous machine function has ended.
- Closing and locking a safety guard must not cause automatic starting of a dangerous machine function. A separate start command must be issued. For exceptions, refer to EN ISO 12100 or relevant C-standards.

Devices from this series are also suitable for process protection.

Before the device is used, a risk assessment must be performed on the machine, e.g. in accordance with the following standards:

- EN ISO 13849-1, Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- EN ISO 12100, Safety of machinery – General principles for design – Risk assessment and risk reduction
- IEC 62061, Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems

Correct use includes observing the relevant requirements for installation and operation, particularly based on the following standards:

- EN ISO 13849-1, Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- EN ISO 14119 (supersedes EN 1088), Safety of machinery – Interlocking devices associated with guards – Principles for design and selection
- EN 60204-1, Safety of machinery. Electrical equipment of machines. General requirements.

The safety switch is only allowed to be operated in conjunction with the intended EUCHNER actuators and the related connection components from EUCHNER. On the use of different actuators or other connection components, EUCHNER provides no warranty for safe function.

Connection of several devices in an AR switch chain is permitted only using devices intended for series connection in an AR switch chain. Check this in the instructions of the device in question.

A maximum of 20 safety switches are allowed to be operated in a switch chain.



Important!

- The user is responsible for the proper integration of the device into a safe overall system. For this purpose, the overall system must be validated, e.g. in accordance with EN ISO 13849-2.
- It is only allowed to use components that are permissible in accordance with the table below.

Table 1: Possible combinations for CTP components

Safety switch	Actuator	
	A-C-H-...	
CTP-... Unicode/Multicode	●	
Key to symbols	●	Combination possible



NOTICE

For information about combination with an AR evaluation unit, please refer to chapter 10.10. *Connection of several CTP-AR in a switch chain on page 23.*

3. Description of the safety function

Devices from this series feature the following safety functions:

Monitoring of guard locking and the position of the safety guard (interlocking device with guard locking according to EN ISO 14119)

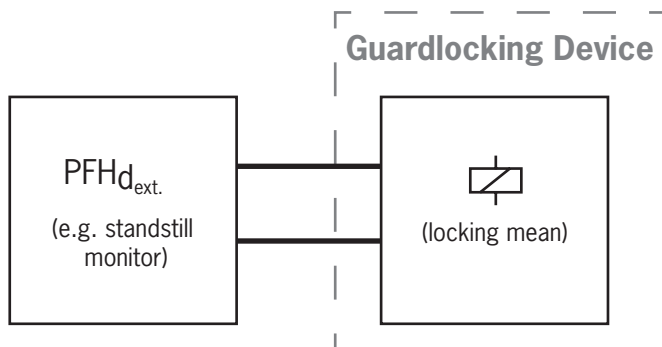
- Safety function (see chapter 6.7. *Switching states on page 9*):
 - The safety outputs are switched off when guard locking is unlocked (monitoring of the locking device).
 - The safety outputs are switched off when the safety guard is open (monitoring of the door position).
 - Guard locking can be activated only when the actuator is located in the switch head (failsafe locking mechanism).
- Safety characteristics: Category, Performance Level, PFH_d (see chapter 13. *Technical data on page 31*).

Control of guard locking

If the device is used as guard locking for personnel protection, control of guard locking must be regarded as a safety function.

The device does not feature a safety characteristic for control of guard locking, because the guard locking solenoid is completely disconnected from the outside (no control function within the device). It therefore does not contribute to the failure probability.

The safety level for the control of the guard locking is only defined by the external control (e. g. PFH_{d, ext.} for the standstill monitor).



4. Exclusion of liability and warranty

In case of failure to comply with the conditions for correct use stated above, or if the safety instructions are not followed, or if any servicing is not performed as required, liability will be excluded and the warranty void.

5. General safety instructions

Safety switches provide personal protection functions. Incorrect installation or tampering can lead to fatal injuries to personnel.

Check the safe function of the safety guard particularly

- › after any setup work
- › after the replacement of a system component
- › after an extended period without use
- › after every fault

Independent of these checks, the safe function of the safety guard should be checked at suitable intervals as part of the maintenance schedule.



WARNING

Danger to life due to improper installation or due to bypassing (tampering). Safety components perform a personal protection function.

- › Safety components must not be bypassed, turned away, removed or otherwise rendered ineffective. On this topic pay attention in particular to the measures for reducing the possibility of bypassing according to EN ISO 14119:2013, section 7.
- › The switching operation must be triggered only by actuators designated for this purpose.
- › Prevent bypassing by means of replacement actuators (only for multicode evaluation). For this purpose, restrict access to actuators and to keys for releases, for example.
- › Mounting, electrical connection and setup only by authorized personnel possessing the following knowledge:
 - specialist knowledge in handling safety components
 - knowledge about the applicable EMC regulations
 - knowledge about the applicable regulations on occupational safety and accident prevention.



Important!

Prior to use, read the operating instructions and keep these in a safe place. Ensure the operating instructions are always available during mounting, setup and servicing. EUCHNER cannot provide any warranty in relation to the readability of the CD for the storage period required. For this reason you should archive a printed copy of the operating instructions. You can download the operating instructions from www.EUCHNER.de.

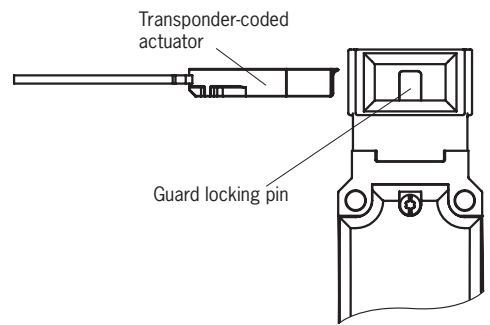
6. Function

The device permits the locking of movable safety guards.

The system consists of the following components: coded actuator (transponder) and switch.


Whether the complete actuator code of the device is taught in (unicode) or not (multicode) depends on the respective version.

- **Devices with unicode evaluation:** The actuator must be assigned to the safety switch by a teach-in operation so that it is detected by the system. This unambiguous assignment ensures a particularly high level of protection against tampering. The system thereby possesses a high coding level.
- **Devices with multicode evaluation:** Unlike systems with unique code detection, on multicode devices a specific code is not polled but instead it is only checked whether the actuator is of a type that can be detected by the system (multicode detection). There is no exact comparison of the actuator code with the taught-in code in the safety switch (unique code detection). The system possesses a low coding level.




When the safety guard is closed, the actuator is moved into the safety switch. When the switch-on distance is reached, power is supplied to the actuator via the switch and data transfer takes place.

If a permissible code is detected, the safety outputs  are switched on.

The safety outputs  and the monitoring output (OL) are switched off when the safety guard is opened.

In the event of a fault in the safety switch, the safety outputs  are switched off and the DIA LED illuminates red. The occurrence of failures is detected at the latest on the next demand to close the safety outputs (e.g. on starting).

6.1. Guard lock monitoring

All versions feature two safe outputs for monitoring guard locking. The safety outputs  (F01A and F01B) are switched off when guard locking is released.

6.2. Door monitoring output (OD)

All versions have a door monitoring output. The door monitoring output is switched on as soon as the actuator is inserted in the switch head (state: safety guard closed and not locked). The door monitoring output also remains switched on when guard locking is active.

6.3. Diagnostics output (OI)

The diagnostics output is switched on in the event of a fault (switch-on condition as for DIA LED).

6.4. Guard locking monitoring output (OL)

The guard locking monitoring output is switched on when guard locking is active.

6.5. Guard locking on version CTP-L1

(guard locking actuated by spring force and released by energy ON)

Activating guard locking: close safety guard; no voltage at the solenoid.

Releasing guard locking: apply voltage to the solenoid.

The spring-operated guard locking functions in accordance with the closed-circuit current principle. If voltage is interrupted at the solenoid, guard locking remains active and the safety guard cannot be opened directly.



Important!

If the safety guard is open when the power supply is interrupted and the guard is then closed, guard locking is activated. This can lead to persons being locked in unintentionally.

The actuator cannot be pulled out of the switch and the safety guard is locked as long as the guard locking pin is extended.

If voltage is applied to the guard locking solenoid, the guard locking pin is retracted and the actuator is released. The safety guard can be opened.

6.6. Guard locking on version CTP-L2

(guard locking actuated by energy ON and released by spring force)



Important!

Use as guard locking for personnel protection is possible only in special cases, after strict assessment of the accident risk (see EN ISO 14119:2013, section 5.7.1)!

Activating guard locking: apply voltage to the solenoid.

Releasing guard locking: disconnect voltage from the solenoid.

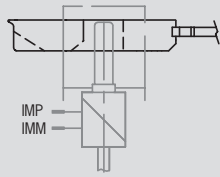
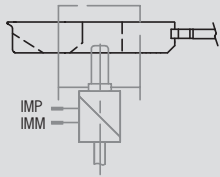
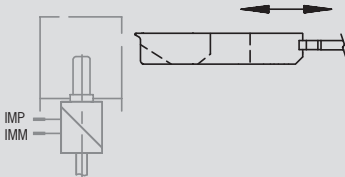

The magnetically actuated guard locking operates in accordance with the open-circuit current principle. If voltage is interrupted at the solenoid, guard locking is released and the safety guard can be opened directly!

The safety guard can be opened as long as no voltage is applied to the guard locking solenoid.

If voltage is applied to the guard locking solenoid, the guard locking pin is held in the extended position and the safety guard is locked.

6.7. Switching states

The detailed switching states for your switch can be found in the system status table. All safety outputs, monitoring outputs and indicating LEDs are described there.

	Safety guard closed and locked 	Safety guard closed and not locked 	Safety guard open 
Voltage on the guard locking solenoid CTP-L1	off	on	(irrelevant)
Voltage on the guard locking solenoid CTP-L2	on	off	(irrelevant)
Safety outputs F01A and F01B 	on	off	off
Guard locking monitoring output OL	on	off	off
Door monitoring output OD	on	on	off



7. Manual release

Some situations require guard locking to be released manually (e.g. malfunctions or an emergency). A function test should be performed after release.

More information on this topic can be found in the standard EN ISO 14119:2013, section 5.7.5.1. The device can feature the following release functions:


7.1. Mechanical release and mechanical key release (can be retrofitted)

In the event of malfunctions, the guard locking can be released with the mechanical release irrespective of the state of the solenoid.

The safety outputs  are switched off when the mechanical release is actuated. Use the safety outputs  to generate a stop command.

The monitoring output OL is switched off; OD can assume an undefined state. Open the safety guard and close it again after resetting the mechanical release. The device will then operate normally again.

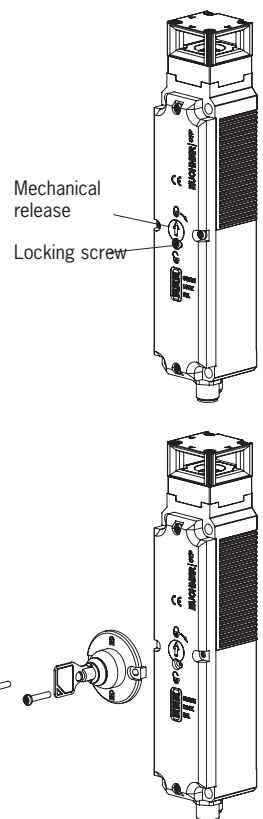
7.1.1. Actuating mechanical release

1. Unscrew locking screw
 2. Using a screwdriver, turn the mechanical release to  in the direction of the arrow
- ➔ Guard locking is released.



Important!

- › The actuator must not be under tensile stress during manual release.
- › After use, reset the mechanical release and screw in and seal the locking screw (for example with sealing lacquer).
- › The mechanical key release must not be used to lock the switch during servicing to prevent activation of guard locking, for example.
- › Loss of the unlocking function due to mounting errors or damage during mounting.
- › Check the release function every time after mounting.
- › Please observe the notes on any enclosed data sheets.



7.1.2. Actuating mechanical key release

On devices with mechanical key release (can be retrofitted), simply turn the key to release. Function as for mechanical release. For mounting, see the mechanical key release supplement.

7.2. Emergency unlocking (can be retrofitted)

Permits opening of a locked safety guard from outside the danger area without tools. For mounting, see the mounting supplement.



Important!



- It must be possible to operate emergency unlocking manually from outside the protected area without tools.
- Emergency unlocking must possess a marking indicating that it may be used only in an emergency.
- The actuator must not be under tensile stress during manual release.
- The unlocking function meets all other requirements from EN ISO 14119.
- Emergency unlocking meets the requirements of Category B according to EN ISO 13849-1:2008.
- Loss of the unlocking function due to mounting errors or damage during mounting.
- Check the release function every time after mounting.
- Please observe the notes on any enclosed data sheets.

7.2.1. Actuating emergency unlocking

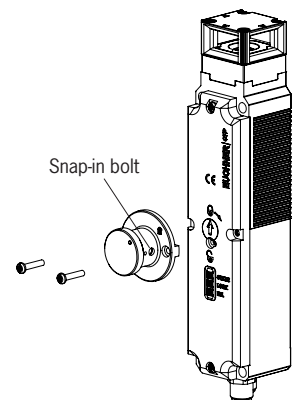
- Turn emergency unlocking clockwise until it clicks into place.

➔ Guard locking is released.

To reset, press the snap-in bolt inward using a small screwdriver or similar tool and turn the emergency unlocking back.

The safety outputs  are switched off when emergency unlocking is actuated. Use the safety outputs  to generate a stop command.

The monitoring output OL is switched off; OD can assume an undefined state. Open the safety guard and close it again after resetting emergency unlocking. The device will then operate normally again.



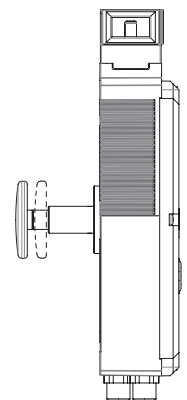
7.3. Escape release (optional)

Permits opening of a locked safety guard from the danger area without tools (see chapter 13.2. *Dimension drawing safety switch CTP... on page 33*).



Important!

- It must be possible to operate the escape release manually from inside the protected area without tools.
- It must not be possible to reach the escape release from the outside.
- The actuator must not be under tensile stress during manual release.
- The escape release meets the requirements of Category B according to EN ISO 13849-1:2008.





7.3.1. Actuating escape release

- Press the red release knob to the end stop

➔ Guard locking is released.

Pull the knob out again to reset.

The safety outputs  are switched off when the escape release is actuated. Use the safety outputs  to generate a stop command.

The monitoring output OL is switched off; OD can assume an undefined state. Open the safety guard and close it again after resetting escape release. The device will then operate normally again.

7.4. Wire front release (optional)

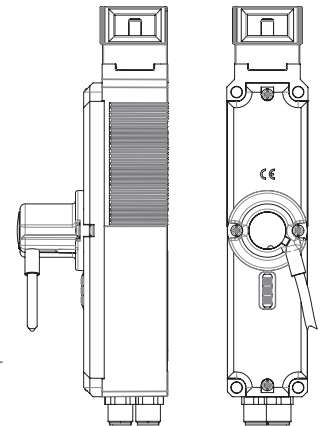
Release via a pull wire. Depending on the type of attachment, the wire front release can be used as emergency unlocking or escape release.

The following applies to non-latching wire front releases:

If the unlocking device is to be used for emergency unlocking, you must take one of the following measures (see EN ISO 14119:2013, section 5.7.5.3):

- › Mount the unlocking device such that reset can only be undertaken with the aid of a tool.
- › Alternatively, the reset can be undertaken at the control system level. E. g. by means of a plausibility check (status of the safety outputs does not match the guard locking control signal).

The emergency-unlocking specifications in chapter 7.2 on Page 11 apply irrespective of this.



Important!

- › The wire front release meets the requirements of Category B according to EN ISO 13849-1:2008.
- › The correct function depends on the laying of the pull wire and on the attachment of the pull handle, and this is the responsibility of the plant manufacturer.
- › The actuator must not be under tensile stress during manual release.

7.4.1. Laying wire front release



Important!

- › Loss of the release function due to mounting errors, damage or wear.
- › Check the release function every time after mounting.
- › When routing the wire front release, ensure that it operates smoothly.
- › Observe the min. bending radius (100 mm) and minimize the number of bends.
- › The switch is not allowed to be opened.
- › Observe the notes on the enclosed data sheets.

8. Changing the approach direction

The approach direction only needs to be changed if the switch is to be approached from the rear.

Proceed as follows:

1. Remove the screws from the safety switch
2. Set the required direction
3. Tighten the screws with a torque of 1.2 Nm

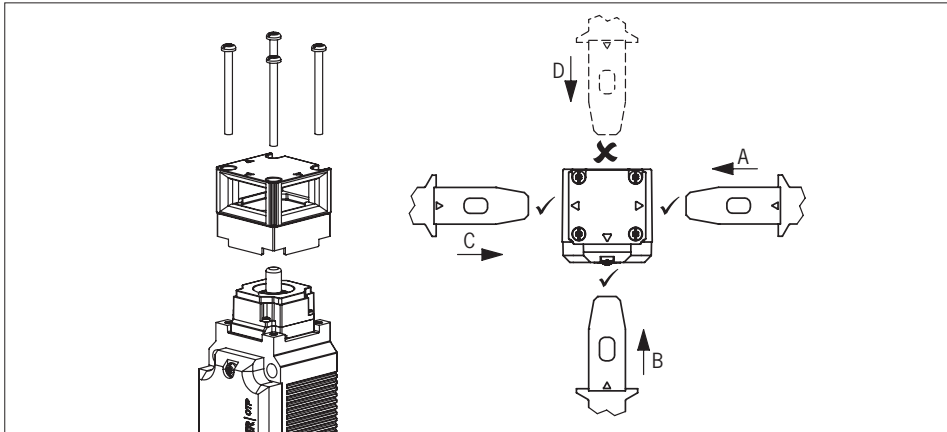


Figure 1: Changing the approach direction

9. Mounting



CAUTION

Safety switches must not be bypassed (bridging of contacts), turned away, removed or otherwise rendered ineffective.

- › Observe EN ISO 14119:2013, section 7, for information about reducing the possibilities for bypassing an interlocking device.



NOTICE

Risk of damage to equipment and malfunctions as a result of incorrect installation.

- › Safety switches and actuators must not be used as an end stop.
- › Observe EN ISO 14119:2013, sections 5.2 and 5.3, for information about fastening the safety switch and the actuator.
- › Protect the switch head against damage as well as penetrating foreign objects such as swarf, sand and blasting shot, etc.
- › Observe the min. door radii (see chapter 13.3.1. *Dimension drawing for actuator CTP-... on page 35*).

A clearance of 12 mm must be maintained around the actuator head (see *Figure 2*). The mounting aid provided can be used to check this clearance.

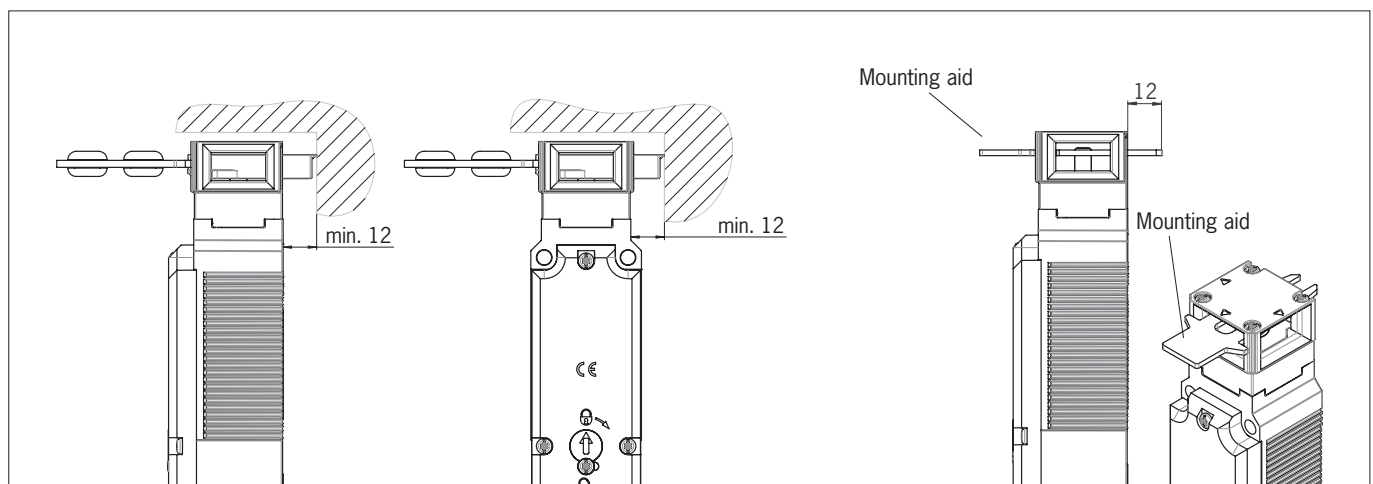


Figure 2: Actuator head clearance and mounting aid


10. Electrical connection

The following connection options are available:

- › Separate operation
- › Series connection with Y-distributors from EUCHNER (only with M12 plug connector)
- › Series connection, e.g. with wiring in the control cabinet.
- › Operation on an AR evaluation unit.



WARNING

- In case of an error, loss of the safety function through incorrect connection.
- › To ensure safety, both safety outputs  (FO1A and FO1B) must always be evaluated.
 - › Monitoring outputs must not be used as safety outputs.
 - › Lay the connection cables with protection to prevent the risk of short circuits.



CAUTION

- Risk of damage to equipment or malfunctions as a result of incorrect connection.
- › The power supply for the evaluation electronics is electrically isolated from the power supply for the guard locking solenoid.
 - › Do not use a control system with pulsing or switch off the pulsing function in your control system. The device generates its own test pulses on the output lines FO1A/FO1B. A downstream control system must tolerate these test pulses, which may be up to 1 ms long on AR devices. The test pulses on AR devices are also output when the safety outputs are switched off. Depending on the inertia of the connected device (control system, relay, etc.), this can lead to short switching processes.
 - › The inputs on an evaluation unit connected must be positive-switching, as the two outputs on the safety switch deliver a level of +24 V in the switched-on state.
 - › All the electrical connections must either be isolated from the mains supply by a safety transformer according to IEC 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent isolation measures (PELV).
 - › All electrical outputs must have an adequate protective circuit for inductive loads. The outputs must be protected with a free-wheeling diode for this purpose. RC interference suppression units must not be used.
 - › Power devices which are a powerful source of interference must be installed in a separate location away from the input and output circuits for signal processing. The cable routing for safety circuits should be as far away as possible from the cables of the power circuits.
 - › In order to avoid EMC interference, the physical environmental and operating conditions at the installation site of the device must comply with the requirements according to the standard EN 60204-1:2006, section 4.4.2 (EMC).



CAUTION

Please pay attention to any interference fields in case of devices such as frequency converters or induction heating systems. Observe the EMC instructions in the manuals from the respective manufacturer.





Important!

If the device does not appear to function when operating voltage is applied (e.g. green STATE LED does not flash), the safety switch must be returned unopened to the manufacturer.

10.1. Notes about



Important!

- For use and operation as per the  requirements ¹⁾, a power supply with the feature “for use in class 2 circuits” must be used.
Alternative solutions must comply with the following requirements:
 - a) Electrically isolated power supply unit with a max. open-circuit voltage of 30 V/DC and a limited current of max. 8 A.
 - b) Electrically isolated power supply unit in combination with fuse as per UL248. This fuse should be designed for max. 3.3 A and should be integrated into the 30 V DC voltage section.
- For use and applications as per the  requirements ¹⁾, a connection cable listed under the UL category code CYJV/7 must be used.

1) Note on the scope of the UL approval: The devices are tested according to the requirements of UL508 and CSA/ C22.2 no. 14 (protection against electric shock and fire).

10.2. Safety in case of faults

- The operating voltage U_B and the solenoid voltage IMP are reverse polarity protected.
- The safety outputs $F01A/F01B$ are short circuit-proof
- A short circuit between $F01A$ and $F01B$ is detected by the switch.
- A short circuit in the cable can be excluded by laying the cable with protection.

10.3. Fuse protection for power supply

The power supply must be provided with fuse protection depending on the number of switches and current required for the outputs. The following rules apply:

Max. current consumption of an individual switch I_{max}

$$I_{max} = I_{UB} + I_{F01A+F01B} + I_{OL} + I_{OD}$$

$$I_{UB} = \text{Switch operating current (40 mA)}$$

$$I_{OL}/I_{OD} = \text{Load current of monitoring outputs (max. 50 mA per monitoring output)}$$

$$I_{F01A+F01B} = \text{Load current of safety outputs F01A + F01B (2 x max. 150 mA)}$$

Max. current consumption of a switch chain ΣI_{max}

$$\Sigma I_{max} = I_{F01A+F01B} + n \times (I_{UB} + I_{OL} + I_{OD})$$

$$n = \text{Number of connected switches}$$

10.4. Requirements for connection cables



CAUTION

Risk of damage to equipment or malfunctions as a result of incorrect connection cables.

- › Use connection components and connection cables from EUCHNER.
- › On the usage of other connection components, the requirements in the following table apply. EUCHNER provides no warranty for safe function in case of failure to comply with these requirements.

Observe the following requirements with respect to the connection cables:

For safety switches CTP-...-AR-...-SAB-... with plug connectors 2 x M12

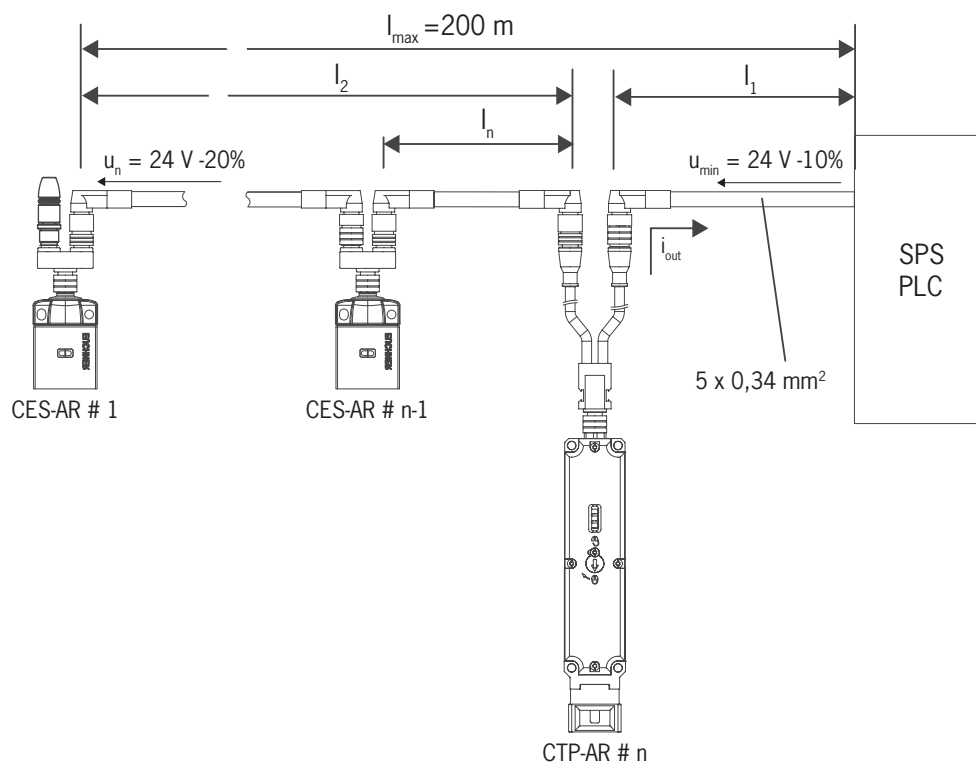
Parameter	Value	Unit
Conductor cross-section min.	0.34	mm ²
R max.	60	Ω/km
C max.	120	nF/km
L max.	0.65	mH/km
Recommended cable type	LIYY 8x or 5x0.34 mm ²	

For safety switches CTP-...-AR-...-SH-... with plug connector M23 (RC18)

Parameter	Value	Unit
Conductor cross-section min.	0.34	mm ²
R max.	60	Ω/km
C max.	120	nF/km
L max.	0.65	mH/km
Recommended cable type	LIFY11Y min. 12-core	

10.5. Maximum cable lengths

Switch chains are permitted up to a maximum overall cable length of 200 m taking into account the voltage drop as a result of the cable resistance (see table below with example data and case example).



n	$I_{F01A/F01B} \text{ (mA)}$	$l_1 \text{ (m)}$
Max. number of switches	Possible output current per channel F01A/F01B	Max. cable length from the last switch to the control system
5	10	150
	25	100
	50	80
	100	50
	150	25
6	10	120
	25	90
	50	70
	100	50
	150	25
10	10	70
	25	60
	50	50
	100	40
	150	25

10.5.1. Determining cable lengths using the example table

Example: 6 switches are to be used in series. Cabling with a length of 40 m is routed from a safety relay in the control cabinet to the last switch (#6). Cables with a length of 20 m each are connected between the individual CES-AR/CTP-L1-... safety switches.

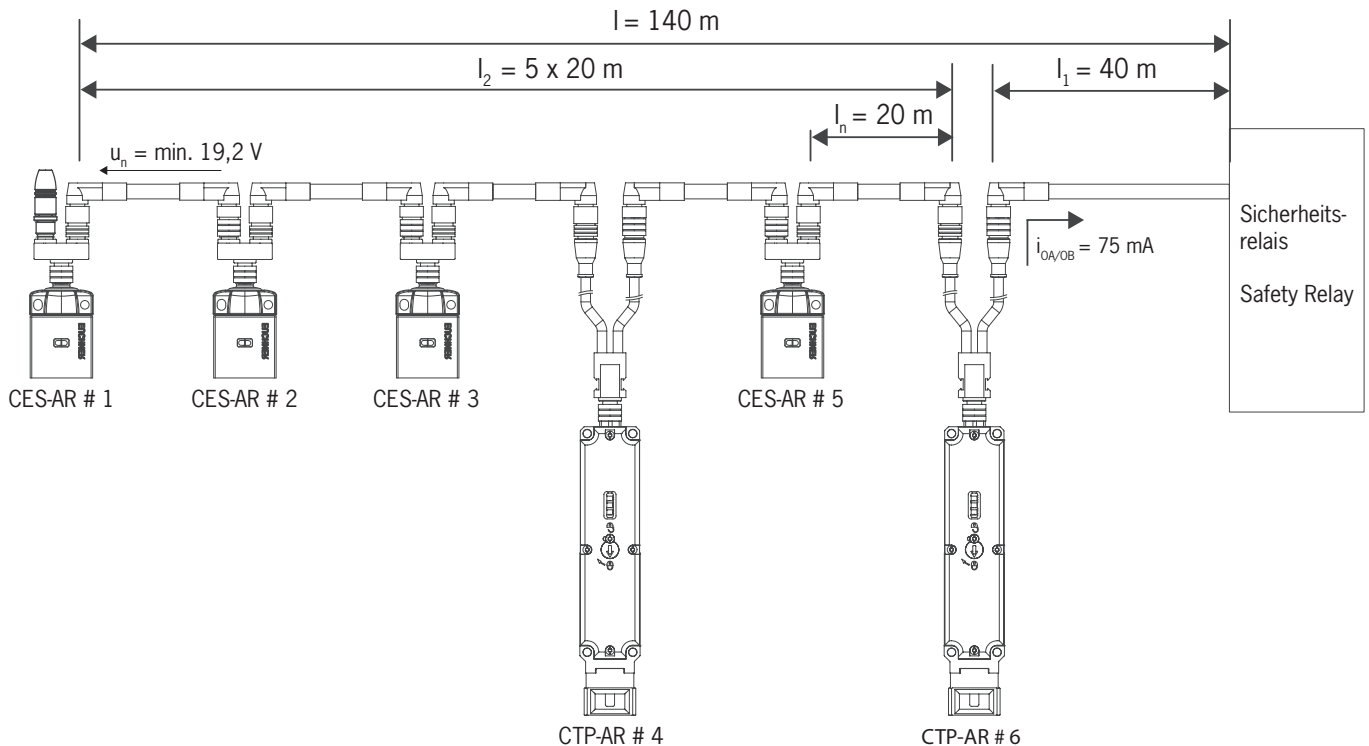


Figure 3: Circuit example with six CES-AR/CTP-L1-...

A safety relay is connected downstream which consumes 75 mA on each of the two safety inputs. This operates over the whole temperature range with a voltage of 19.2 V (corresponds to 24 V -20%).

All the relevant values can now be determined using the example table:

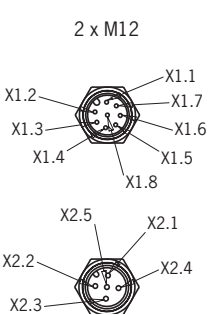


1. Select the corresponding section in the column n (max. number of switches). Here: 6 switches.
 2. In column $I_{FO1A/FO1B}$ (possible output current per channel FO1A/FO1B), find a current greater than or equal to 75 mA. Here: 100 mA.
- ➔ It is then possible to determine the maximum cable length from the last switch (#6) to the control system from column I_1 . Here: a length of 50 m is permitted.

Result: The desired cable length I_1 of 40 m is below the permitted value from the table. The overall length of the switch chain I_{max} of 140 m is less than the maximum value of 200 m.

- ➔ The planned application is therefore functional in this form.

10.6. Pin assignment safety switch CTP-...-AR-...-SAB-... with plug connectors 2 x M12

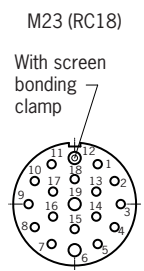


Wiring diagram A

Plug connector (view of connection side)	Pin	Designation	Function	Wire color Connection cable 1)
 <p>2 x M12</p>	X 1.1	FI1B	Enable input for channel 2	WH
	X 1.2	UB	Operating voltage of AR electronics, 24 V DC	BN
	X 1.3	FO1A	Safety output, channel 1 	GN
	X 1.4	FO1B	Safety output, channel 2 	YE
	X 1.5	OL	Guard locking monitoring output	GY
	X 1.6	FI1A	Enable input for channel 1	PK
	X 1.7	0 V UB	Operating voltage of AR electronics 0 V	BU
	X 1.8	RST	Reset input	RD
	X 2.1	IMM	Operating voltage of guard locking solenoid 0 V	BN
	X 2.2	OD	Door monitoring output	WH
	X 2.3	OI	Diagnostics output	BU
	X 2.4	IMP	Operating voltage of guard locking solenoid, 24 V DC	BK
	X 2.5	-	Not used	GY

1) Only for standard EUCHNER connection cable

10.7. Pin assignment safety switch CTP-...-AR-...-SH-... with plug connector M23 (RC18)

Wiring diagram B

Plug connector (view of connection side)	Pin	Designation	Function	Wire color Connection cable 1)
 <p>M23 (RC18)</p> <p>With screen bonding clamp</p>	1	IMP	Operating voltage of guard locking solenoid, 24 V DC	VT
	2	FI1A	Enable input for channel 1	RD
	3	FI1B	Enable input for channel 2	GY
	4	FO1A	Safety output, channel 1 	RD/BU
	5	FO1B	Safety output, channel 2 	GN
	6	UB	Operating voltage of AR electronics, 24 V DC	BU
	7	RST	Reset input	GY/PK
	8	OD	Door monitoring output	GN/WH
	9	OI	Diagnostics output	YE/WH
	10	OL	Guard locking monitoring output	GY/WH
	11	-	n.c.	BK
	12	FE	Function earth (must be connected to meet the EMC requirements)	GN/YE
	13	-	n.c.	PK
	14	-	n.c.	BN/GY
	15	-	n.c.	BN/YE
	16	-	n.c.	BN/GN
	17	-	n.c.	WH
	18	IMM	Operating voltage of guard locking solenoid 0 V	YE
	19	0 V UB	Operating voltage of AR electronics 0 V	BN

1) Only for standard EUCHNER connection cable

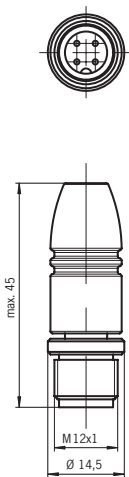
10.8. Connector assignment for Y-distributor

(only for version with plug connectors 2 x M12)

Pin assignment for safety switch
CTP-L1-... (plug X1, 8-pin plug)
and Y-distributor (8-pin socket)

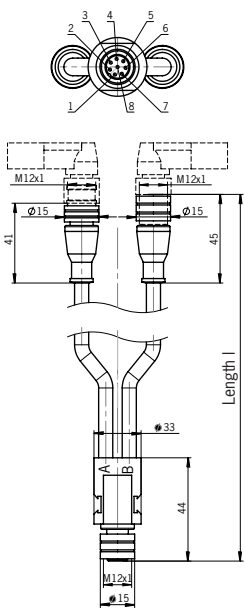
Pin	Function
X1.1	FI1B
X1.2	UB
X1.3	F01A
X1.4	F01B
X1.5	OL
X1.6	FI1A
X1.7	0 V
X1.8	RST

Strapping plug 097645 4-pin,
plug
(figure similar)



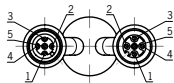
Y-distributor with connecting
cable
111696 or 112395

Socket

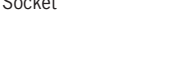


Order No.	Length l [mm]
111696	200
112395	1000

Plug



Socket




Pin	Function	Pin	Function
X2.1	UB	X3.1	UB
X2.2	F01A	X3.2	FI1A
X2.3	0 V	X3.3	0 V
X2.4	F01B	X3.4	FI1B
X2.5	RST	X3.5	RST

10.9. Connection of a single CTP-AR

If a single CTP-AR is used, connect the switch as shown in Figure 4. The monitoring outputs can be routed to a control system. The switches can be reset via the RST input. To do this, a voltage of 24 V is applied to the RST input for at least 3 s. The RST input must be connected to 0 V if it is not used.



WARNING

In case of an error, loss of the safety function through incorrect connection.
 ▶ To ensure safety, both safety outputs  (FO1A and FO1B) must always be evaluated.



Important!

▶ The example shows only an excerpt that is relevant for connection of the CTP system. The example illustrated here does not show complete system planning. The user is responsible for safe integration in the overall system. Detailed application examples can be found at www.EUCHNER.de. Simply enter the order number of your switch in the search box. All available connection examples for the device can be found under "Downloads."

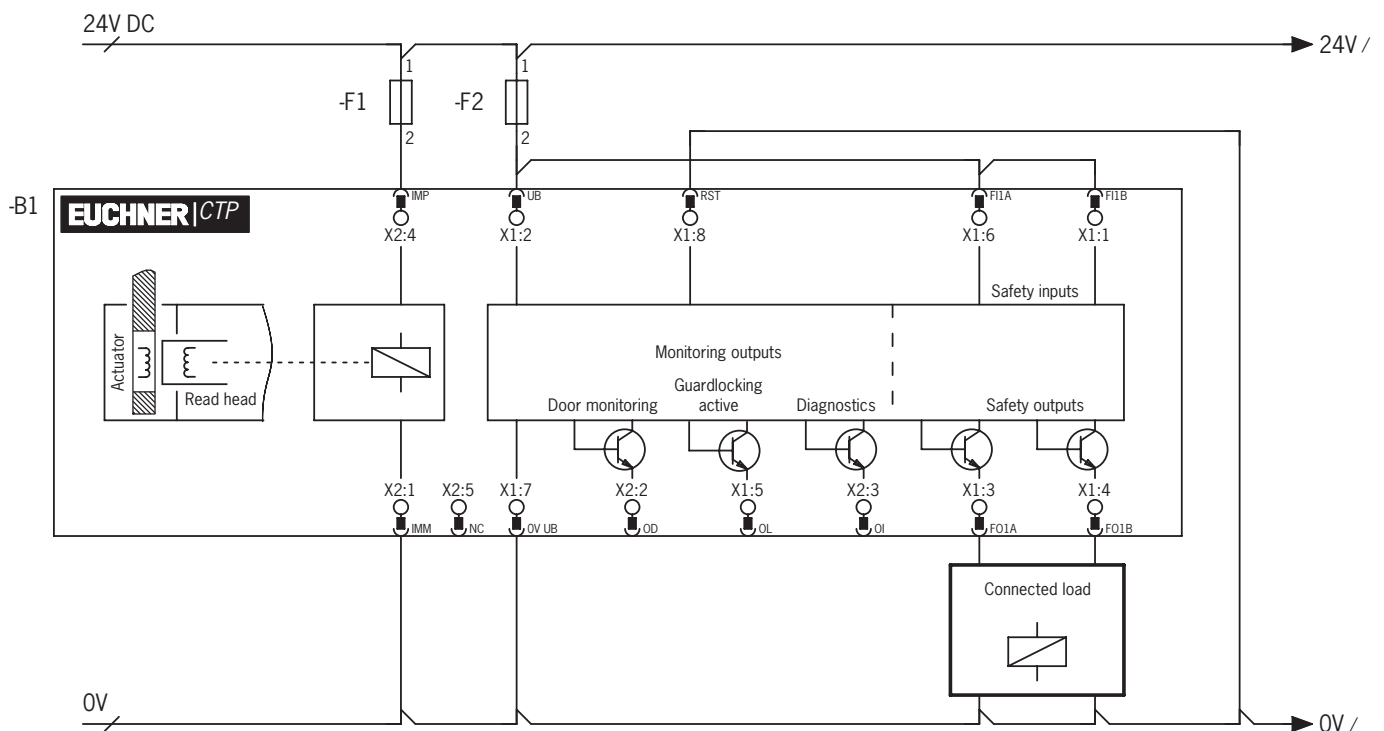


Figure 4: Connection example for separate operation, version with plug connectors 2xM12

10.10. Connection of several CTP-AR in a switch chain




Important!

- An AR switch chain may contain a maximum of 20 safety switches.
- The example shows only an excerpt that is relevant for connection of the CTP system. The example illustrated here does not show complete system planning. The user is responsible for safe integration in the overall system. Detailed application examples can be found at www.EUCHNER.de. Simply enter the order number of your switch in the search box. You will find all available connection examples for the device in Downloads.

The series connection is shown here based on the example of the version with plug connectors 2 x M12. The series connection of the version with plug connector RC18 has similar behavior, but is realized using additional terminals in a control cabinet.

The switches in the version with plug connectors 2 x M12 are connected one after the other with the aid of pre-assembled connection cables and Y-distributors. If a safety guard is opened or if a fault occurs on one of the switches, the system shuts down the machine. A higher level control system cannot, however, detect which safety guard is open or on which switch a fault has occurred with this connection technology.

The safety outputs  are permanently assigned to the respective safety inputs of the downstream switch. FO1A must be routed to FI1A and FO1B to FI1B. If the connections are interchanged (e. g. FO1A to FI1B), the unit will switch to the fault state.

Always use the RST input in series connections. All switches in a chain can be reset at the same time with this reset input. To do this, a voltage of 24 V must be applied to the RST input for at least 3 s. If input RST is not used in your application, it should be connected to 0 V.

Note the following on this aspect:

- A common signal must be used for all switches in the chain. This can be a changeover switch or the output of a control system. A button is not suitable because Reset must always be connected to GND during operation (see switch S11 in *Figure 5 on page 24*).
- Reset must always be performed simultaneously for all switches of the chain.

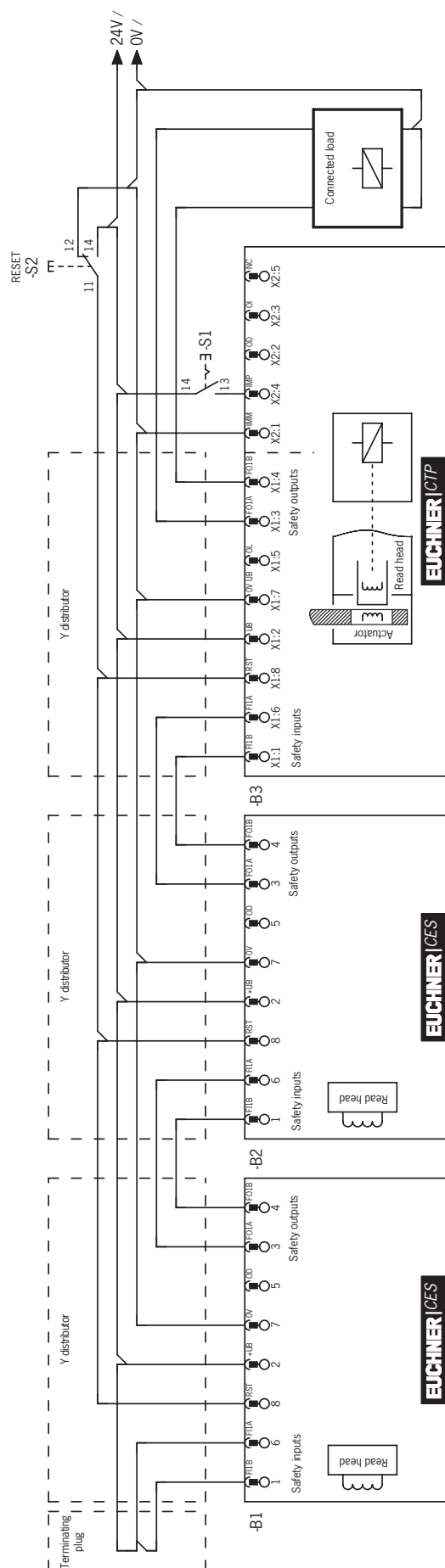



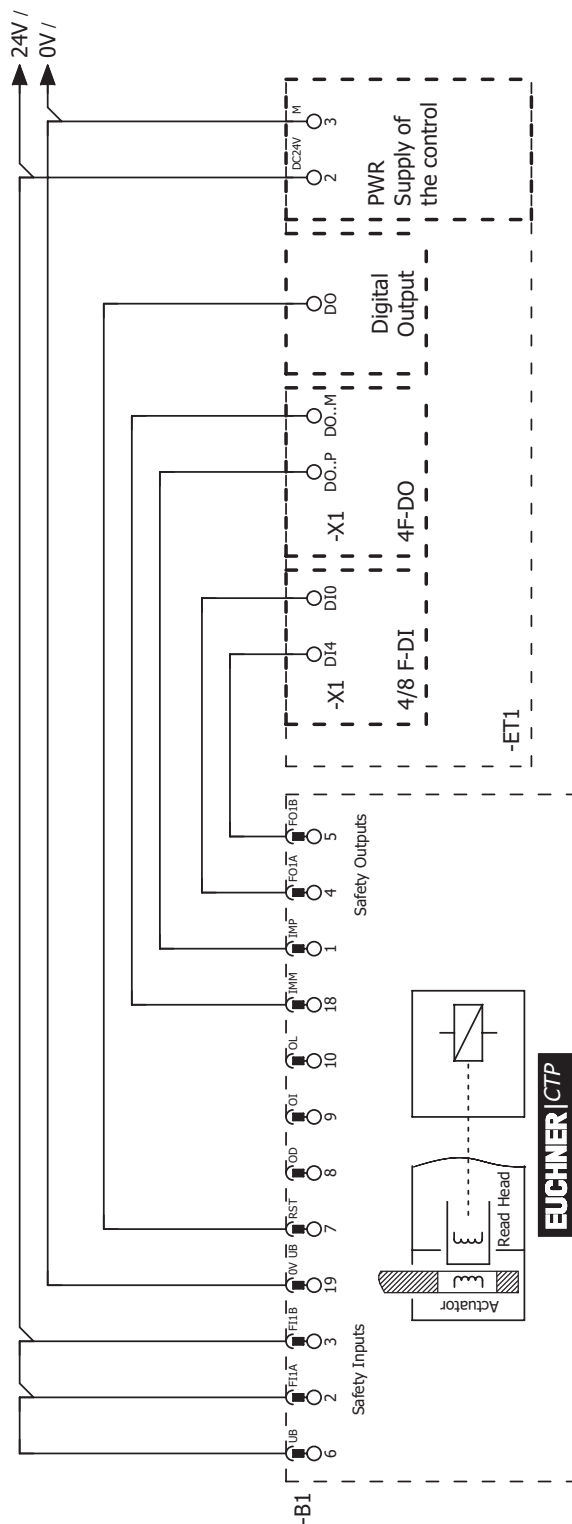
Figure 5: Connection example for operation in a CES-AR switch chain

10.11. Notes on operation with safe control systems

Please observe the following requirements for connection to safe control systems:

- › Use a common power supply for the control system and the connected safety switches.
- › A pulsed power supply must not be used for UB. Tap the supply voltage directly from the power supply unit. If the supply voltage is connected to a terminal of a safe control system, this output must provide sufficient electrical current.
- › Always connect inputs FI1A and FI1B directly to a power supply unit or to outputs FO1A and FO1B of another EUCHNER AR device (series connection). Pulsed signals must not be present at inputs FI1A and FI1B.
- › The safety outputs  (FO1A and FO1B) can be connected to the safe inputs of a control system. Prerequisite: The input must be suitable for pulsed safety signals (OSSD signals, e.g. from light curtains). The control system must tolerate test pulses on the input signals. This normally can be set up by parameter assignment in the control system. Observe the notes of the control system manufacturer. For the pulse duration of your safety switch, please refer to chapter 13. *Technical data on page 31.*
- › The following applies for single-channel control of the guard locking:
The guard locking (IMM) and the control system must have the same ground.
- › For dual-channel control of the solenoid voltage by safe outputs of a control system, the following points must be observed (see also *Figure 6 on page 26*):
 - If possible, switch off the pulsing of the outputs in the control system.
 - Pulses up to a length of max. 5 ms are tolerated.

A detailed example of connecting and setting the parameters of the control system is available for many devices at www.euchner.de in Download » Applications » CTP. The features of the respective device are dealt with there in greater detail.



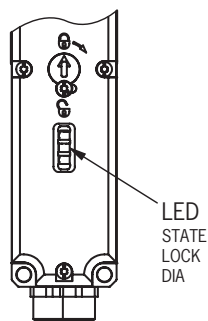
26

11. Setup

11.1. LED indicators

You will find a detailed description of the signal functions in chapter 12. *System status table on page 30.*

LED	Color
STATE	Green
LOCK	Yellow
DIA	Red



11.2. Teach-in function for actuator (only for unicode evaluation)

The actuator must be allocated to the safety switch using a teach-in function before the system forms a functional unit.

During a teach-in operation, the safety outputs are switched off, i.e. the system is in the safe state.

The teach-in operation is fully automatic.



Tip!

Prior to switching on, close the safety guard on which the actuator to be taught in is installed. The teach-in operation starts immediately after switching on. This feature simplifies above all the teaching-in with series circuits and on large systems.



Important!

- › The teach-in operation may be performed only if the device does not have any internal errors.
- › Devices in the condition as supplied remain in teach-in standby state until you have successfully taught in the first actuator. Once taught in, switches remain in the teach-in standby state for approx. 3 min. after each switch on.
- › The safety switch disables the code of the previous actuator if teach-in is carried out for a new actuator. Teach-in is not possible again immediately for this actuator if a new teach-in operation is carried out. The disabled code is released again in the safety switch only after a third code has been taught-in.
- › The safety switch can only be operated with the last actuator taught-in.
- › If the switch detects the actuator that was most recently taught when in teach-in standby state, this state is ended immediately and the switch changes to normal state.
- › The actuator to be taught-in is not activated if it is within the operating distance for less than 30 s.

11.2.1. Teaching-in actuator

1. Establish teach-in standby:
 - Devices in the condition as supplied: unlimited teach-in standby after switching on
 - Switches already taught in: teach-in standby is available for approx. 3 min after switching on
- ➔ Teach-in standby indication, STATE LED flashes 3x repeatedly
2. Insert the actuator during teach-in standby.
 - ➔ The automatic teach-in operation starts (duration approx. 30 s).
During the teach-in operation the STATE LED flashes (approx. 1 Hz).
Alternate flashing of the STATE and DIA LEDs acknowledges the successful teach-in operation.
Teach-in errors are indicated by the illumination of the red DIA LED and a flashing code on the green State LED (see chapter 12. *System status table on page 30*).
3. Switch off operating voltage UB (min. 3 s).
 - ➔ The code of the actuator that was just taught in is activated in the safety switch.
4. Switch on operating voltage UB.
 - ➔ The device operates normally.

11.2.2. Teach-in function with series connection, replacing and teaching in device

It is recommended not to teach in the actuators in the series connection but to teach them in one by one instead. Teach-in in a series connection works analogously to separate operation in principle. It is a prerequisite that the steps below are followed. Further steps might have to be observed for mixed switch chains (e. g. for chains with CES and CET). Observe the operating instructions for the other devices in the chain for this purpose.

Work on the wiring (e. g. during device replacement) should generally be performed in a de-energized state. On certain systems, it is nevertheless necessary to perform this work and subsequent teach-in during ongoing operation.

Input RST must be connected as shown in *Figure 5 on page 24* to permit this.

Proceed as follows:

1. Open the safety guard on which the switch or actuator is to be replaced.
2. Mount the new switch or actuator and prepare it for the teach-in operation (see chapter 11.2.1. *Teaching-in actuator on page 28*).
3. Close all safety guards in the chain and activate guard locking.
4. Actuate the reset for at least 3 s (24 V on RST).
 - ➔ On the safety switch that is positioned at a new actuator, the green LED flashes at approx. 1 Hz and the actuator is taught-in. This takes approx. 30 s. Do not switch off during this time and do not actuate reset! The teach-in operation is complete when the STATE and DIA LEDs flash alternately.
5. Actuate the reset for at least 3 s (24 V on RST).
 - ➔ The system restarts and then continues to function in normal operation.

11.3. Functional check



WARNING

Danger of fatal injury as a result of faults in installation and functional check.

- › Before carrying out the functional check, make sure that there are no persons in the danger area.
- › Observe the valid accident prevention regulations.

11.3.1. Mechanical function test

The actuator must slide easily into the actuating head. Close the safety guard several times to check the function. For devices with mechanical unlocking device (emergency unlocking or escape release), the correct function of the mechanical unlocking device must be checked as well.
























11.3.2. Electrical function test






After installation and any fault, the safety function must be fully checked. Proceed as follows:

1. Switch on operating voltage.
 - ➔ The machine must not start automatically.
 - ➔ The safety switch carries out a self-test. The green STATE LED flashes for 10 s at 5 Hz. The green STATE LED then flashes at regular intervals.
2. Close all safety guards. Guard locking by solenoid force: activate guard locking.
 - ➔ The machine must not start automatically. It must not be possible to open the safety guard.
 - ➔ The green STATE LED illuminates continuously.
3. Enable operation in the control system.
 - ➔ It must not be possible to deactivate the guard locking as long as operation is enabled.
4. Disable operation in the control system and deactivate guard locking.
 - ➔ The safety guard must remain locked until there is no longer any risk of injury.
 - ➔ It must not be possible to start the machine as long as the guard locking is deactivated.

Repeat steps 2 - 4 for each safety guard.

12. System status table

Operating mode	Actuator/door position	Safety outputs F01A and F01B 	Guard locking monitoring output OL	Door monitoring output OD	LED indicator Output		LOCK (yellow)	State
					STATE (green)	D/A (red) and diagnostics output OI		
Self-test	X	off	off	off	 5 Hz (10 s)	○	○	Self-test after power up
Normal operation	closed	on	on	on		○		Normal operation, door closed and locked
	closed	off	on	on	 1 x in-verse	○		Normal operation, door closed and locked, safety outputs not switched because: - Preceding device in the switch chain signals "door open" (only with series connection)
	closed	off	off	on	 1 x in-verse	○	○	Normal operation, door closed and not locked
	open	off	off	off	 1 x	○	○	Normal operation, door open
Teach-in operation (only unicode)	X	off	off	off	 3 x	○	○	Device in teach-in standby
	closed	off	X	on	 1 Hz	○	○	Teach-in operation
	X	off	X	X	 ↔ 	○	○	Positive acknowledgment after completion of teach-in operation
Fault display	X	off	X	X	 1 x		○	Fault in teach-in operation (only unicode) Actuator removed from the operating distance prior to the end of the teach-in operation or faulty actuator detected.
	X	off	off	off	 2 x		○	Input fault (e. g. missing test pulses, illogical switch state from previous switch in the switch chain)
	X	off	off	off	 3 x		○	Read error (e. g. actuator faulty)
	X	off	off	off	 4 x		○	Output fault (e.g. short circuit, loss of switching ability)
	X	off	X	X	 5 x		○	Disabled actuator detected
	X	off	off	off	○		X	Internal fault

Key to symbols	○			LED not illuminated
				LED illuminated
	 10 Hz (8 s)			LED flashes for 8 s at 10 Hz
	 3 x			LED flashes three times, and this is then repeated
	 ↔ 			LEDs flash alternately
	X			Any state

After the cause has been remedied, faults can generally be reset by opening and closing the safety guard. If the fault is still displayed afterward, use the reset function or briefly interrupt the power supply. Please contact the manufacturer if the fault could not be reset after restarting.



Important!

If you do not find the displayed device status in the System status table, this indicates an internal device fault. In this case, you should contact the manufacturer.

13. Technical data



NOTICE

If a product data sheet is included with the product, the information on the data sheet applies.

13.1. Technical data for safety switch CTP-AR

Parameter	min.	Value typ.	max.	Unit
General				
Material		Die-cast zinc		
- Switch head		Reinforced thermoplastic		
- Switch housing				
Installation position		Any		
Degree of protection	with plug connector M12	IP67/IP69		
	with plug connector RC18	IP 65		
		(screwed tight with the related mating connector)		
Safety class according to EN IEC 61558		III		
Degree of contamination		3		
Mechanical life		1 x 10 ⁶ operating cycles		
Ambient temperature at UB = 24 V	-20	-	+55	°C
Actuator approach speed, max.		20		m/min
Actuating/extraction/retention force at 20 °C		35/30/20		N
Locking force F _{max} ¹⁾		2600		N
Locking force F _{Zh} ¹⁾ according to EN ISO 14119		F _{Zh} = F _{max} /1.3 = 2000		N
Weight		Approx. 0.42		kg
Connection type (depending on version)		2 plug connectors M12, 5 and 8-pin 1 plug connector RC18, 19-pin (as yet no UL approval)		
Operating voltage UB (reverse polarity protected, regulated, residual ripple < 5%)		24 ± 15% (PELV)		V DC
Current consumption I _{UB}		40		mA
For the approval according to UL the following applies		Operation only with UL class 2 power supply, or equivalent measures		
Switching load according to UL		DC 24 V, class 2		
External fuse (operating voltage UB)	0.25	-	2	A
External fuse (solenoid operating voltage IMP)	0.5	-	8	A
Rated insulation voltage U _i	-	-	50	V
Rated impulse withstand voltage U _{imp}	-	-	0.5	kV
Resilience to vibration		Acc. to EN 60947-5-3		
EMC protection requirements		Acc. to EN 60947-5-3		
Ready delay	-	8	-	s
Risk time for single device	-	-	260	ms
Risk time delay per device		5		ms
Switch-on time	-	-	400	ms
Discrepancy time	-	-	10	ms
Test-pulse duration		1		ms
Safety outputs F01A/F01B				
		Semiconductor outputs, p-switching, short circuit-proof		
- Output voltage U _{F01A} /U _{F01B} ²⁾				
HIGH U _{F01A} /U _{F01B}	UB - 1.5	-	UB	V DC
LOW U _{F01A} /U _{F01B}	0	-	1	
Switching current per safety output	1	-	150	mA
Utilization category acc. to EN 60947-5-2		DC-13 24V 150 mA		
		Caution: outputs must be protected with a free-wheeling diode in case of inductive loads		
Switching frequency		0.5		Hz
Monitoring outputs OL, OI, OD				
		p-switching, short circuit-proof		
Output voltage	0.8 x UB	-	UB	V DC
Max. load	-	-	50	mA
Solenoid				
Solenoid operating voltage IMP (reverse polarity protected, regulated, residual ripple < 5 %)		DC 24 V +10%/-15%		
Current consumption solenoid I _{IMP}		400		mA
Power consumption		6		W
Duty cycle		100		%
Reliability values acc. to EN ISO 13849-1				
Mission time		20		years
Monitoring of guard locking and the safety guard position				
Category		4		
Performance Level (PL)		e		
PFD _d		4.1 x 10 ⁻⁹ /h		
Control of the guard locking				
Category				
Performance Level (PL)		Depends on external control		
PFD _d				

1) Only applies in combination with straight actuators.


2) Values at a switching current of 50 mA without taking into account the cable length.


13.1.1. Typical system times

Please refer to the technical data for the exact values.

Ready delay: After switching on, the unit carries out a self-test. The system is ready for operation only after this time.

Switch-off time of safety outputs: The max. reaction time t_{on} is the time from the moment when the safety guard is locked to the moment when the safety outputs switch on.

Simultaneity monitoring, safety inputs FI1A/FI1B: If the safety inputs have different switching states for longer than a specific time, the safety outputs  (FO1A and FO1B) will be switched off. The device switches to fault state.

Risk time according to EN 60947-5-3: If an actuator moves outside the operating distance, the safety outputs  (FO1A and FO1B) are switched off after the risk time at the latest.

If several devices are operated in a series connection, the risk time of the overall device chain will increase with each device added. Use the following calculation formula:


$$t_r = t_{r,e} + (n \times t_i)$$


t_r = Total risk time

$t_{r,e}$ = Risk time, single device (see technical data)

t_i = Risk time delay per device

n = Number of additional devices (total number -1)

Discrepancy time: The safety outputs  (FO1A and FO1B) switch with a slight delay in relation to each other. They assume the same signal state at the latest after the discrepancy time.

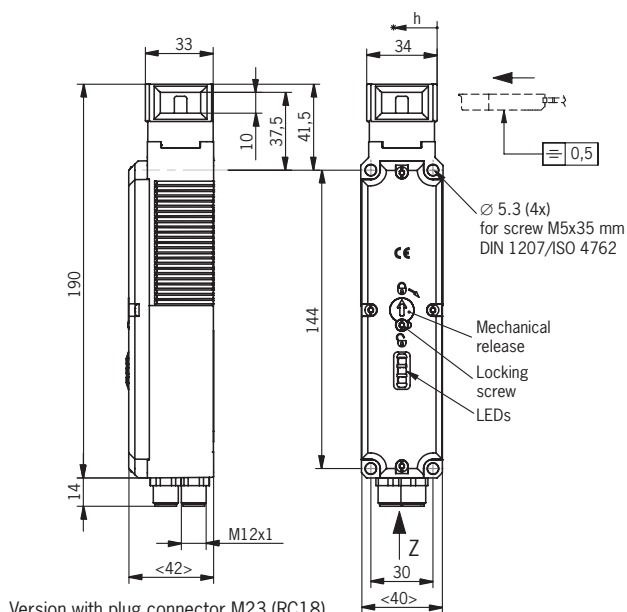
Test pulses at the safety outputs: The device generates its own test pulses on the safety outputs  (FO1A and FO1B). A downstream control system must tolerate these test pulses.

This can usually be set up in the control systems by parameter assignment. If parameter assignment is not possible for your control system or if shorter test pulses are required, please contact our support organization.

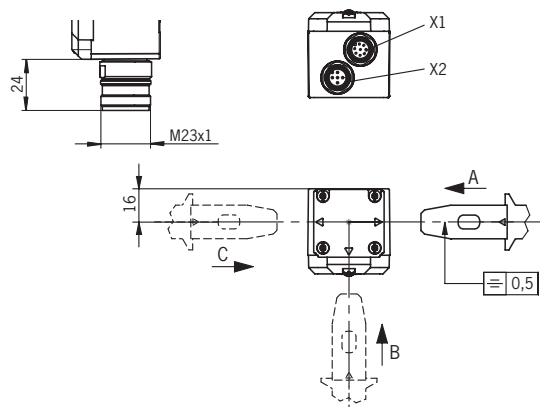
The test pulses are also output when the safety outputs are switched off.

13.2. Dimension drawing safety switch CTP...

Version with plug connector 2 x M12

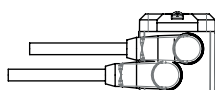


Version with plug connector M23 (RC18)

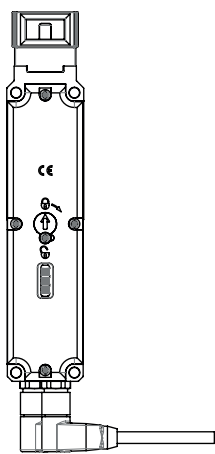
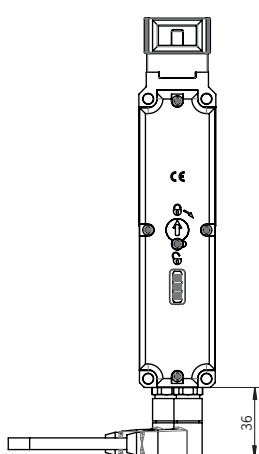
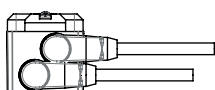


Plug connectors 2 x M12

Cable exit left

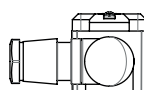


Cable exit right

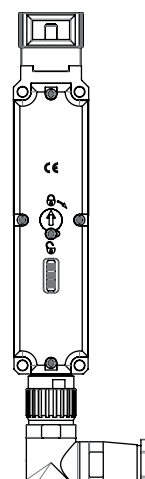
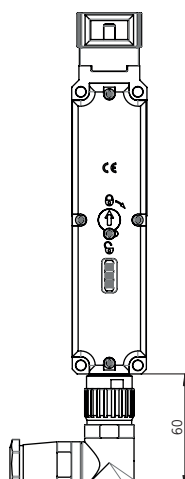
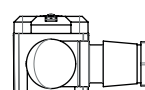


Plug connector M23

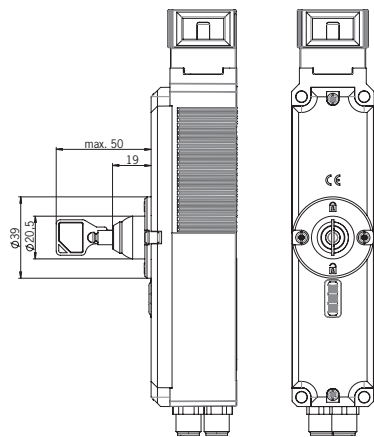
Cable exit left



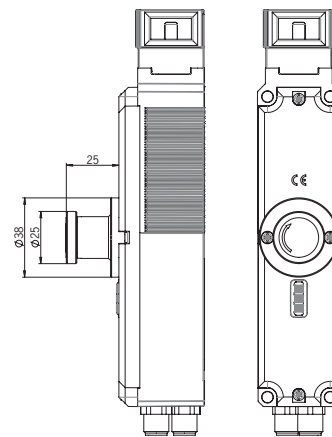
Cable exit right



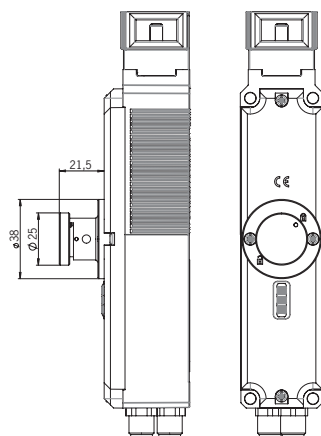
With mechanical key release



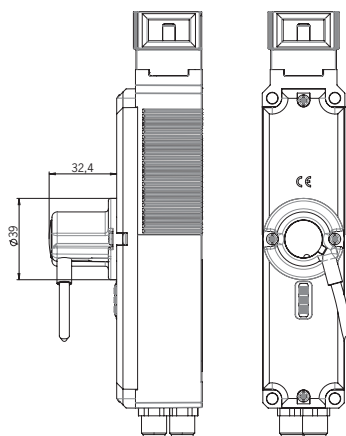
With mechanical release



With emergency unlocking



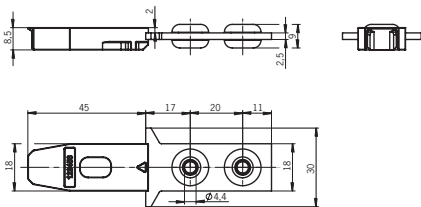
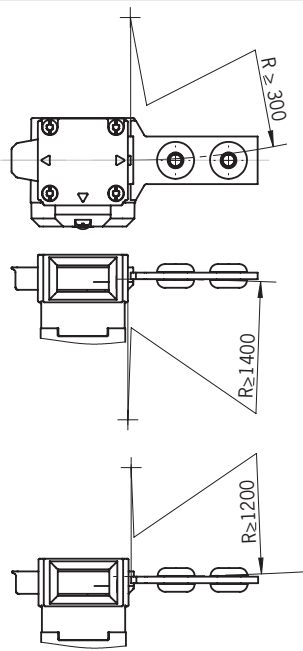
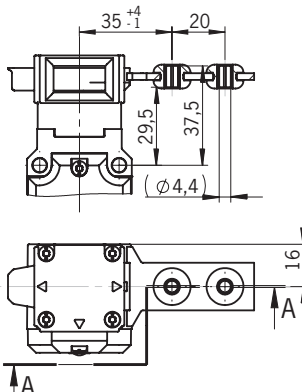
With front wire release



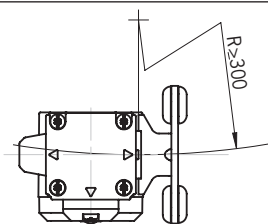
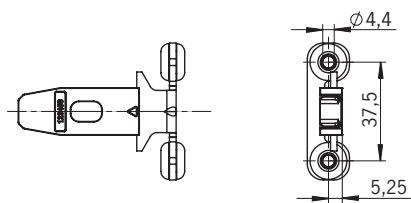
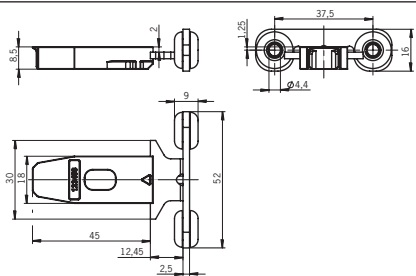
13.3. Technical data for actuator CTP-...

Parameter	Value			Unit
	min.	typ.	max.	
Housing material	Fiber reinforced plastic			
Weight	0.03 ... 0.06 (depending on version)			kg
Ambient temperature	-20	-	+55	°C
Degree of protection acc. to EN IEC 60529	IP67/IP69K			
Mechanical life	1 x 10 ⁶			
Locking force, max. Straight and hinged actuator Bent actuator	2600 1500			N
Installation position	Any			
Power supply	Inductive via read head			

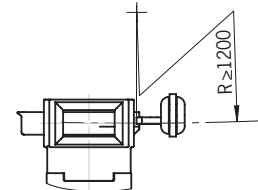
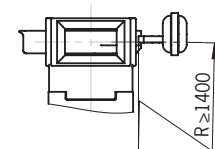
13.3.1. Dimension drawing for actuator CTP-...

Straight actuator	Dimension drawing	Min. door radius [mm]	Order no./item
	 <p>Technical drawing of the straight actuator showing front, side, and detail views with dimensions:</p> <ul style="list-style-type: none"> Front view dimensions: 18, 45, 17, 20, 11, 18, 30, $\phi 4,4$. Side view dimensions: 8,5, 2, 2,5. Detail view shows a cross-section of the mounting bracket. 	 <p>Technical drawing showing the minimum door radius requirements for the straight actuator:</p> <ul style="list-style-type: none"> Top view: $R \geq 300$ Side view (left): $R \geq 1400$ Side view (right): $R \geq 1200$ 	<p>122666 A-C-H-G-SST-122666</p>
	<p>AA 1 : 2</p>  <p>Technical drawing of the straight actuator at a 1:2 scale, showing front and side views with dimensions:</p> <ul style="list-style-type: none"> Front view dimensions: 35 ± 1, 20, 29,5, 37,5, $\phi 4,4$. Side view dimensions: 16, A. 		

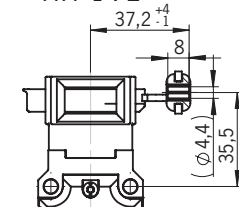
Bent actuators



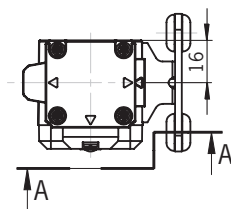
122667
A-C-H-W-SST-122667



A-A 1 : 2



122668
A-C-H-W-SST-122668



EN

14. Ordering information and accessories



Tip!

Suitable accessories, such as cables or installation material, can be found at www.EUCHNER.de. Simply enter the order number of your item in the search box and open the item view. "Accessories" contains accessories that can be combined with the item.

15. Inspection and service



WARNING

Danger of severe injuries due to the loss of the safety function.

- If damage or wear is found, the complete switch and actuator assembly must be replaced. Replacement of individual parts or assemblies is not permitted
- Check the device for proper function at regular intervals and after every fault. For information about possible time intervals, refer to EN ISO 14119:2013, section 8.2.

Regular inspection of the following is necessary to ensure trouble-free long-term operation:

- Check the switching function (see chapter 11.3. *Functional check on page 29*)
- Check all additional functions (e.g. escape release, lockout mechanism, etc.)
- Check the secure fastening of the devices and the connections
- Check for soiling

No servicing is required. Repairs to the device are only allowed to be made by the manufacturer.



NOTICE

The year of manufacture is given in the laser marking at the bottom right corner. The current version number in the format (V X.X.X) can also be found on the device.

16. Service

If service support is required, please contact:

EUCHNER GmbH + Co. KG

Kohlhammerstraße 16

D-70771 Leinfelden-Echterdingen

Service telephone:

+49 711 7597-500

E-mail:

support@euchner.de

Internet:

www.euchner.de

17. Declaration of conformity

More than safety.



EUCHNER

EUCHNER GmbH + Co. KG
Kohlhammerstraße 16
70771 Leinfelden-Echterdingen
Germany

EG-Konformitätserklärung
EC-Declaration of Conformity
CE-Déclaration de Conformité
CE-Dichiarazione di conformità
CE-Declaración de Conformidad

Original DE
Translation EN
Traduction FR
Traduzione IT
Traducción ES

123042-01-12/14

Die nachfolgend aufgeführten Produkte sind konform mit den Anforderungen der folgenden Richtlinien (falls zutreffend):
The beneath listed products are in conformity with the requirements of the following directives (if applicable):
Les produits mentionnés ci-dessous sont conformes aux exigences imposées par les directives suivantes (si valable)
I prodotti sotto elencati sono conformi alle direttive sotto riportate (dove applicabili):
Los productos listados a continuación son conforme a los requisitos de las siguientes directivas (si fueran aplicables):

I:	2006/42/EG 2006/42/EC 2006/42/CE 2006/42/CE 2006/42/CE	Maschinenrichtlinie Machinery directive Directive Machines Direttiva Macchine Directiva de máquinas
II:	2004/108/EG 2004/108/EC 2004/108/CE 2004/108/CE 2004/108/CE	EMV Richtlinie EMC Directive Directive de Compatibilité électromagnétique Direttiva EMV Directiva CEM

Die Schutzziele der Niederspannungsrichtlinie wurden gemäß Anhang I, Nr. 1.5.1 der Maschinenrichtlinie eingehalten.
The safety objectives of the Low-Voltage Directive comply with Annex I, No. 1.5.1 of the Machinery Directive.
Les objectifs de sécurité de la Directive Basse Tension sont conformes à l'annexe I, No. 1.5.1 de la Directive Machines
Gli obiettivi di sicurezza della Direttiva Basse Tensione sono conformi a quanto riportato all'allegato I, No. 1.5.1 della Direttiva Macchine.
Los objetivos de seguridad de la Directiva de Bajo Voltaje cumplen con el Anexo I, No. 1.5.1 de la Directiva de Máquinas

Folgende Normen sind angewandt:
Following standards are used:
Les normes suivantes sont appliquées:
Vengono applicate le seguenti norme:
Se utilizan los siguientes estándares:

a:	EN 60947-5-3:2013
b:	EN ISO 14119:2013
c:	EN ISO 13849-1:2008

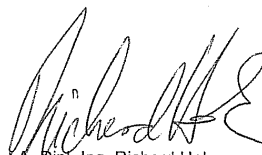
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Sicherheitsschalter <i>Safety Switches</i> <i>Interrupteurs de sécurité</i> <i>Finecorsa di sicurezza</i> <i>Interruptores de seguridad</i>	CTP...	I, II	a, b, c	UQS 123565

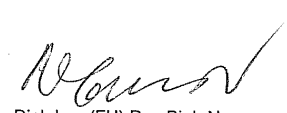
Benannte Stelle
Notified Body
Organisme notifié
Sede indicata
Entidad citada

NB 0035
TÜV Rheinland Industrie Service GmbH
Am Grauen Stein - 51105 Köln - Germany

Leinfelden, Dezember 2014

EUCHNER GmbH + Co. KG
Kohlhammerstraße 16
70771 Leinfelden-Echterdingen
Germany


i.A. Dipl.-Ing. Richard Holz
Leiter Elektronik-Entwicklung
Manager Electronic Development
Responsable Développement Électronique
Direttore Sviluppo Elettronica
Director de desarrollo electrónico


i.A. Dipl.-Ing. (FH) Duc Binh Nguyen
Dokumentationsbevollmächtigter
Documentation manager
Responsable documentation
Responsabilità della documentazione
Agente documenta

Euchner GmbH + Co. KG
Kohlhammerstraße 16
D-70771 Leinfelden-Echterdingen
info@euchner.de
www.euchner.de

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